

[0094] However, the period could be 4 ms of UE processing time for measurement if the RS for measurement is available every TTI. Reference in this regard can be made to FIG. 4A herein, which reproduces FIG. 1 from 3GPP TSG-RAN2 #72 meeting Tdoc R2-106507 Jacksonville, U.S., 15-19 Nov. 2010 Agenda Item: 7.1.1.4, Source: Samsung, Title: SCell activation and CQI reporting (incorporated by reference). Reference can also be made to FIG. 4B herein, which reproduces FIG. 2 from R2-106507 and shows an example of where the UE is not able to report CQI for a SCell immediately after the SCell is activated. As is stated in R2-106507, the issue is whether the UE transmits CQI even if it does not have a valid measurement. It is assumed in R2-106507 that if the UE is required to transmit the CQI even if it has no measurement result the only logical CQI value to be reported is CQI=0 (i.e., out of range or OOR). Thus it would be the choice between “no CQI transmission” and “OOR reporting”.

[0095] Transmission Mode 9 (TM9) has been defined for Rel-10 DL MIMO for supporting SU-MIMO up to rank-8 and SU/MU dynamic switching (see, for example, 3GPP TSG RAN WG1 Meeting #62bis R1-105534 Xi'an, China, Oct. 11-15, 2010 Source: Nokia Siemens Networks, Nokia, Title: Remaining Details of Transmission Mode 9 and DCI 2C, incorporated by reference). Reference with regard to TM9 can also be made to 3GPP TS 36.211. V10.0.0 (2010-12) Technical Specification 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 10), Section 6.10.5 “CSI reference signals”, incorporated by reference herein. As disclosed in ETSI TS 136 211, CSI reference signals are transmitted on one, two, four or eight antenna ports using $p=15$, $p=15,16$, $p=15, \dots, 18$ and $p=15, \dots, 22$, respectively. CSI reference signals are defined for $\Delta f=15$ kHz only. With respect to sequence generation, the reference-signal sequence $r_{l,n_s}(m)$ is defined by

$$r_{l,n_s}(m) = \frac{1}{\sqrt{2}}(1 - 2 \cdot c(2m)) + j \frac{1}{\sqrt{2}}(1 - 2 \cdot c(2m+1)),$$

where $m=0, 1, \dots, N_{RB}^{max,DL}-1$ where n_s is the slot number within a radio frame and l is the OFDM symbol number within the slot. The pseudorandom sequence $c(i)$. The pseudo-random sequence generator is initialized with $c_{init}=2^{10} \cdot (7 \cdot (n_s+1) + l + 1) \cdot (2 \cdot N_{ID}^{cell} + 1) + 2 \cdot N_{ID}^{cell} + N_{CP}$ at the start of each OFDM symbol where

$$N_{CP} = \begin{cases} 1 & \text{for normal CP} \\ 0 & \text{for extended CP} \end{cases}$$

[0096] With respect to mapping to resource elements in subframes configured for CSI reference signal transmission, the reference signal sequence $r_{l,n_s}(m)$ shall be mapped to complex-valued modulation symbols $a_{k,l}^{(p)}$ used as reference symbols on antenna port p according to $a_{k,l}^{(p)} = w_{l'} \cdot r_{l,n_s}(m')$ where

$$k = k' + 12m + \begin{cases} -0 & \text{for } p \in \{15, 16\}, \text{ normal cyclic prefix} \\ -6 & \text{for } p \in \{17, 18\}, \text{ normal cyclic prefix} \\ -1 & \text{for } p \in \{19, 20\}, \text{ normal cyclic prefix} \\ -7 & \text{for } p \in \{21, 22\}, \text{ normal cyclic prefix} \\ -0 & \text{for } p \in \{15, 16\}, \text{ extended cyclic prefix} \\ -3 & \text{for } p \in \{17, 18\}, \text{ extended cyclic prefix} \\ -6 & \text{for } p \in \{19, 20\}, \text{ extended cyclic prefix} \\ -9 & \text{for } p \in \{21, 22\}, \text{ extended cyclic prefix} \end{cases}$$

$$l = l' + \begin{cases} l' & \text{CSI reference signal configurations 0-19, normal cyclic prefix} \\ 2l'' & \text{CSI reference signal configurations 20-31, normal cyclic prefix,} \\ l'' & \text{CSI reference signal configurations 0-27, normal cyclic prefix} \end{cases}$$

$$w_{l'} = \begin{cases} 1 & p \in \{15, 17, 19, 21\} \\ (-1)^{p'} & p \in \{16, 18, 20, 22\} \end{cases},$$

$$l'' = 0, 1,$$

$$m = 0, 1, \dots, N_{RB}^{DL} - 1, \text{ and}$$

$$m' = m + \left\lfloor \frac{N_{RB}^{max,DL} - N_{RB}^{DL}}{2} \right\rfloor.$$

[0097] The quantity (k', l') and the necessary conditions on n_s are given by Tables 6.10.5.2-1 and 6.10.5.2-2 for normal cyclic prefix reproduced in FIG. 1(b) and extended cyclic prefix reproduced in FIG. 1(c). Multiple CSI reference signal configurations according to TM 9 can be used in a given cell,

[0098] one configuration for which the UE shall assume non-zero transmission power for the CSI-RS, and

[0099] zero or more configurations for which the UE shall assume zero transmission power.

[0100] For each bit set to one in the 16-bit bitmap Zero-PowerCSI-RS configured by higher layers, the UE shall assume zero transmission power for the resource elements corresponding to the four CSI reference signal column in Tables 6.10.5.2-1 and 6.10.5.2-2 for normal and extended cyclic prefix, respectively. The most significant bit corresponds to the lowest CSI reference signal configuration index and subsequent bits in the bitmap correspond to configurations with indices in increasing order.

[0101] CSI reference signals according to TM 9 can only occur in

[0102] downlink slots where $ns \bmod 2$ fulfils the condition in Tables 6.10.5.2-1 and 6.10.5.2-2 for normal and extended cyclic prefix, respectively, and

[0103] where the subframe number fulfils the conditions set forth in Table 6.10.5.3-1 Moreover, CSI reference signals according to TM 9 cannot be transmitted

[0104] in the special subframe(s) in case of frame structure type 2,

[0105] when transmission of a CSI-RS would collide with transmission of synchronization signals, PBCH, or SystemInformationBlockType1 messages,

[0106] in subframes configured for transmission of paging messages.